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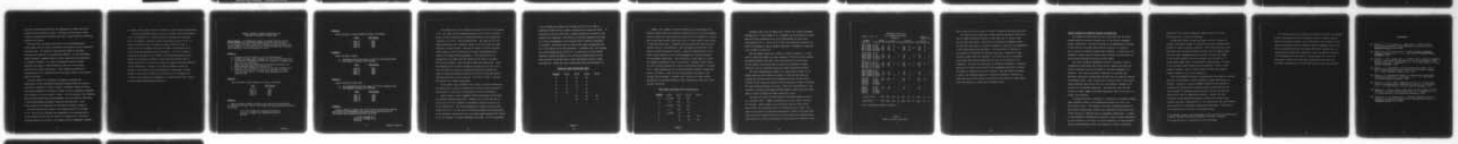

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RESEARCH REPORT NO. 27

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BY

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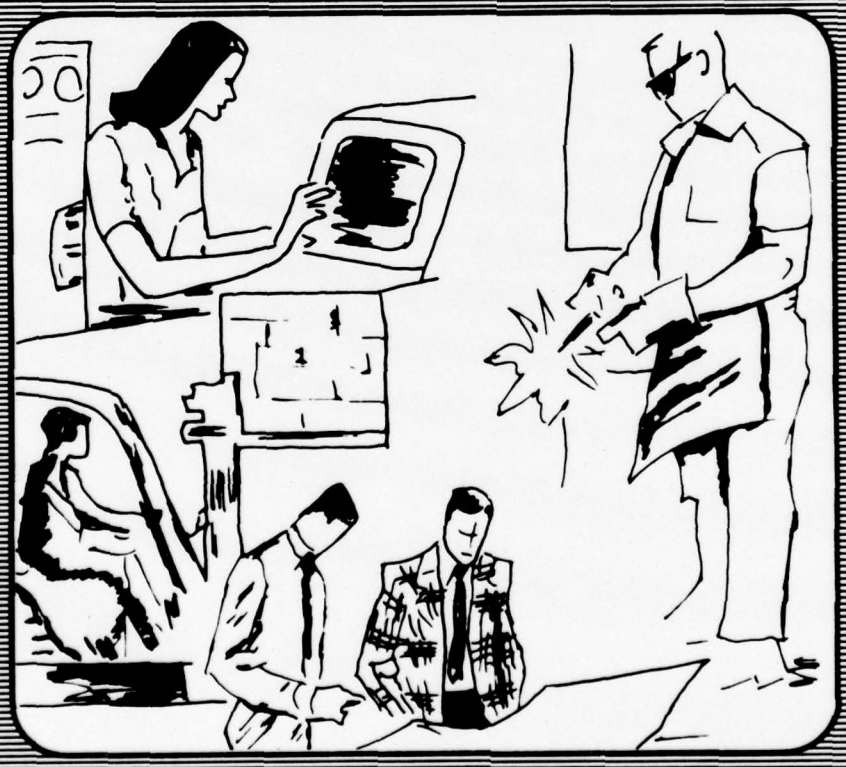

OFFICE OF CIVILIAN PERSONNEL DEPARTMENT OF THE NAVY

OCP Research Report No. 27

Laboratory Workforce Planning with a Conversational Manpower Model

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*Naval Underwater Systems Center

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Washington, D. C. 20390

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INTRODUCTION

Manpower Planning has evolved to the point where there are a variety of sophisticated techniques available to many organizations. There is also a fair amount of skill and expertise available within and outside the government to utilize these techniques. The difference between successful and unsuccessful organizations in the future will be the degree to which manpower technology will be accepted and utilized by the entire organization.

The Manpower Planning and Analysis Department of the Naval Underwater Systems Center (NUSC) has been involved since 1972 in application studies of manpower planning techniques. This research has resulted in operational and experimental systems to bring this new technology to the Center's management. Perhaps the most interesting of these studies is the conversational use of manpower models for intake planning. In this application, the intent is to provide the technology to permit the two-way dialogues between the manpower analyst/manager and the supporting computer-based models. The purpose of this report is to describe the operational use of this system as part of a major realignment of NUSC's workforce.

The manpower models were orginally developed by A. Charnes, W. W. Cooper, and R. J. Niehaus [2] for the Management Sciences Branch of the U. S. Navy Office of Civilian Manpower Management (OCMM).[1/] The development of the Manpower Planning Models at NUSC has been the result of the coordinated efforts of four organizations. It began as a project of the Manpower Planning Division of the Naval Underwater Systems Center to improve

[1/] Recently renamed the Office of Civilian Personnel

Manpower Planning at the Laboratory. In early 1972, NUSC initiated contacts with the Management Sciences Branch, U. S. Navy Office of Civilian Manpower Management to learn of possible applications of the models at the local installation level. This resulted in a joint preliminary probe in the summer of 1972 which included the Center for Cybernetics Studies, University of Texas, and the Management Sciences Research Group, Carnegie-Mellon University. An extensive checkout of the stability of manpower movement and transition statistics and the application of a version of the OCMM recruiting requirements model (ORRM) was the result of this research [4].

NUSC has received support from the Naval Personnel Research and Development Center (NPRDC) to continue work in conjunction with OCMM as part of the Shore Activity Manpower Planning System (SAMPS) project.[1] NUSC now has in operation the conversational application of the recruitments requirement model. Part of the continuing effort and task is to determine the feasibility of using large-scale manpower planning models at the field activity level to see if they are accurate enough for management use. Results so far have been encouraging.

MANPOWER PLANNING AT NUSC

With the current climate within the Department of the Navy, top management at NUSC is concerned with those manpower policies that impact on ceilings, budget, and average grade of the workforce. Therefore, the types of problems that NUSC is particularly interested in are those which address these issues. The typical manpower planning problems that need to be addressed include:

1. How many junior professionals should be hired under different conditions involving budgets, ceiling, salary, and average grade constraints?

2. What will the distribution of the workforce be under various manpower ceilings over different time periods given alternative occupational and grade level goals?

3. What alternative promotion policy strategies can be employed at each occupational and grade level given different separation rates and average grade restrictions?

4. Can NUSC meet end-year strength ceilings if the seperation rate decreases? What effects will this have on new hires? promotions?

5. Under current conditions at NUSC, are the EEO goals (as defined in the Affirmative Action Plan) attainable? What jobs should be designated as upward mobility?

In order to accomplish these aspects of manpower planning and better utilization of human resources, NUSC has developed a number of tools to accomplish our goal of manpower planning. These include:

1. Automated Personnel Data System which consists of both historical and current transactions files. This allows NUSC to use historical data, to see current trends, and also to develop manpower profiles for the Center at any period in time.

2. Statistical Data and Reports gathered from the personnel system which helps NUSC provide to management various types of data and reports affecting management needs.

3. Integrated Financial and Personnel Files used to bring together manpower, budgeting, and progrma information. NUSC uses both the current

year financial data along with the program summary data allowing an examination of the technical program and manpower requirements for a three-year planning period.

4. Long-Range Staffing Plans developed by top management. The staffing plan in NUSC is the allocation of "billets" among all Center organizations.

5. Manpower Planning Models including both a NUSC developed probablistic retirement forecasting model and the OCMM recruiting requirements model.

The objective of the OCMM recruiting requirements model is to recommend how many people must be hired/fired in order to meet "as closely as possible" a set of manpower requirements. This is done considering internal transfers, attrition, and budget and ceiling constraints. In the case of NUSC, the manpower requirements are obtained through estimate of how many and what kinds of personnel are needed for each research work unit. As described in [3], the computer programs associated with the Integrated Financial and Personnel Files aggregate this data into the format required by the model.

The value of a computerized model is that alternative solutions can be analyzed under various problem constraints over a very short period of time so that the impact of different policies can be judged. It is the object of the model to allow the manager to try out a given solution, look at it and make changes of various decisions, of alternative sets of conditions that may be imposed on him, and see what their probable results will be.

In utilizing the current conversational version of the model, the management at NUSC is concerned with trends and alternative solutions

involved under a variety of Manpower Planning strategies. The manpower policies that are developed at NUSC are basically the responsibility of the Director of Manpower Resources with approval by the Center's Senior Technical Staff. The remainder of this paper involves a description of the conversational form of the model and its use in the Centers decision making environment.

INSTALLATION OF CURRM

The installation of the Conversational Use of the Recruiting Requirements Model (CURRM) Computer software at NUSC is part of a continuing series of projects. The original applications at NUSC involved staffing of Center programs over a 2-year time period which was divided into 2 six-month planning intervals followed by a 1-year planning period.[2/] This batch version of the model was in use for over a year before the software for the conversational model (CURRM) was completed.

The original OCMM models have been used for several years in a batch computer environment. This system could handle massive amounts of relevant data accurately and quickly. Its use was curtailed, however, since only computer professionals had the required knowledge to feed in the data, operate the systems, and interpret the outputs. This situation led to the task of making the manpower planning models conversational. Conversational meaning that users engage in dialogues with the computer, which would guide them by prompting the users with questions and eliciting responses. Therefore, the models could be used directly by the managers or subject-matter specialists. NUSC was chosen as the test site because of prior successful experience with the batch version of the model.

[2/] See Charnes, Cooper, Niehaus, and Padalino [3].

Installation of CURRM involved three separate phases. Phase I was completed in August 1974 and involved transferring NUSC data to OCMM. The data base was then used in testing CURRM on the UNIVAC 1108 computer of the Naval Command System Support Activity (NAVCOSSACT). Phase II was conducted at NUSC in January 1975. Barry Newton from NAVCOSSACT and Stanley Korn of NUSC tested the CURRM package of NUSC's UNIVAC 1108 to determine operational and compatibility problems. The final installation, Phase III, was completed in March 1975 and involved the efforts of Barry Newton, Stanley Korn and John Fulford from NAVCOSSACT. Phase III accomplished the installation while overcoming some difficulties imposed by differences of the operational environment. In addition, the existing systems features of CURRM were reviewed and several changes were suggested by NUSC personnel. After two months of debugging and testing, a managerial test was conducted which introduced CURRM to several members of top management at NUSC. The results of these initial test were reported by Niehaus, Sholtz, and Thompson [8].

Based upon these encouraging tests, a review was made to determine what additional features were necessary to make CURRM completely responsive to the requirements of the NUSC environment. An agreement was reached between NUSC, OCMM, and NAVCOSSACT to implement the changes required. This included the transfer of additional computer programs from OCMM to NUSC. These programs were successfully installed in September 1975 and are fully operational. With this additional capability, NUSC is now able to create all the input files locally, thereby being able to operate CURRM totally without outside assistance from other agencies.

The present version of CURRM installed at NUSC has several exceptional features. The capability to change multiple data with a single command

has made the model very flexible and responsive to the needs of the user. Another feature, which allows the user to save a problem and return to it later, affords the manager the capability to use CURRM to solve several different manpower problems interchangeably. If the manager desires to return to a previous problem, CURRM will resume with the specified problem at the point where the manager left it. CURRM also has a variety of reports which are useful to the user. The short mini-reports of CURRM aid the user during the decision-making session. These reports give a brief overview of the impact of his decisions on the problem at hand. This allows the user to evaluate his decisions and make further changes, if he desires. Complete management reports, which contain the details of all the mini-reports combined are also available. Once the user has arrived at an alternative worth saving, he can give the command to have these outputs produced for future reference. A short example of the conversational dialogue is shown in Figure 1. In this dialogue only two of the commands are shown. The first is the "PS" or "Print Solution" command which provides a mini-report summarizing the strategic indicators. These indicators include strength data by period including hiring (firing) information and how well the manpower requirements can be met. The second command is the "PB" or Print Below Manpower Goal data for each job category below goal. A full description of the conversational commands can be found in [5].

The linear programming model to use CURRM at NUSC consists of 515 rows and 635 columns. It costs approximately $55 to use CURRM for a 35-minute session which include starting a new problem, solving the problem two times, making 4 changes and printing two reports on a high-speed

```
WHAT CAN I DO FOR YOU ?
>PS
CURRM PROBLEM : PROBLEM 7                                    6 OCT 76  VER-003

PER    PROJ      MAX       ON      CEILING   ABOVE    BELOW     RIFS
       BUDGET    BUDGET    BOARD             GOAL     GOAL
       (MILL)    (MILL)
0                          2755
1        0.00      0.00     2663      2663       1        1       96
2        0.00      0.00     2624      2624       0        0       44
3        0.00      0.00     2624      2624       0        0       15
4        0.00      0.00     2624      2624       6        5       10


WHAT CAN I DO FOR YOU ?
>PB
HOW MUCH BELOW ?
>1
PER OCCUP/     GOAL  ACTUAL   ABOVE   BELOW   HIRES    RIFS  VER #
     LEVEL                                                    3
 1  2   /2      55      54       0       1      25       0
 4  2   /2      53      48       0       5      21       0


WHAT CAN I DO FOR YOU ?
>PR
HOW MANY RIFS ?
>10
PER OCCUP/     GOAL  ACTUAL   ABOVE   BELOW   HIRES    RIFS  VER #
     LEVEL                                                    3
 1  2   /3     812     812       0       0       0      42
 1  4   /3     534     534       0       0       0      23
 2  2   /3     798     798       0       0       0      20
 2  4   /3     524     524       0       0       0      10
```

Figure 1

Example of CURRM Conversational Dialogue

printer. We are currently using a terminal that prints at 30 cps. We have found the printing speed of 10 cps terminals to be inadequate because the text in CURRM is quite lengthy and some of the mini-reports provide by CURRM can average about 20 lines each. Testing is also underway at OCMM on the use of a CRT and printer combination at 120 cps.

The original concept of CURRM involved using personnel not particularly familiar with the model and in effect leading them through a problem solution by a set of instructions that would be displayed upon the console. The concept used at NUSC is different. The Manpower Planning and Analysis Department has been tasked as the support group responsible for running the model. The decision-maker develops alternative problems and strategies. then, analysts within the Department define all of the input parameters and develop all the alternative solutions. At this point, they review the results with the managers and then other possible strategies might be tried resulting in additional solutions. The next section of this report describes such a dialogue.

EXAMPLES OF MODEL APPLICATION

NUSC has a continuing need for highly-trained engineers and scientists to perform research, design, development, analysis, tests, evaluation, and in-service engineering work in underwater weapon systems. Because of the specialized nature of the mission and functions of the Center, it is not always feasible to recruit fully-trained professional people from the general labor market to perform the Center's work. It is, therefore, mandatory that NUSC recruit the necessary talent from the colleges and universities and help these personnel to develop themselves, through planned fromal training and on-the-job assignments, to perform at the required level of complexity and responsibility.

Because of this requirement, along with the requirement to maintain the proper occupational mix of all employees, NUSC is interested in an analysis of the dynamic processes of recruitment, promotion, and attrition

and their interrelationship within the organization to assure the sound personnel policy decisions are made. Therefore, with the model in hand, a series of problems were formulated that have an impact upon the recruiting program at the Center.

The Center finds the model useful mainly for establishing general trends rather than for specific hiring and firing plans for each occupational and grade group. The reason for this being that NUSC is a research laboratory and therefore is not production oriented. In this environment, making estimates of manpower goals for every occupational and grade group is extremely difficult. As a result, we generally take the initial population and adjust it proportionately to meet our total ceiling restriction for future time periods. These numbers then become the manpower goals for the specified future time period, which is the required input to the model.

The basic problem is to determine the number of excesses and deficiencies in each occupational and grade grouping during the planning period FT 76 through FY 79 under a variety of manpower ceilings and goals with special emphasis on the effect of hires of junior professional engineers and scientists at the GS 5 and GS 7 levels. For the purposes of this analysis, seven problems were defined which management felt were realistic approaches to developing manpower strategies during the planning years. These seven problems with assumptions and constraints are shown in Figure 2.

The cases presented here apply to the planning period FY 76 through FY 79. The first four problems were formulated for the planning period FY 76 through FY 78 and the last three FY 77 through FY 79. The set of problems presented is typical of the complex nature of management problems,

in general, which usually involves attainment of several goals simultaneously

The cases considered reflect a series of possible ceiling restrictions for FY 76 through FY 79. Problem A deals with meeting this ceiling by FY 76 and Problem C specifies we must attain these goals by FY 78. In addition, Problems B and D represent the added restriction that we contract out our firefighter and guard functions, and distribute their billets among the Engineer/Scientist population. This is an attempt to alleviate the pressure of the cutbacks on the Engineer/Scientist group. Problem E is the same as Problem C except that the separation rate is reduced from 5.5% to 5.0% and the ceilings are changed reflecting additional ceiling information. Problem F is the same as Problem A except for changes to the separation rate and adjustment of the manpower ceilings. Problem G is the same as Problem F except that in FY 77 through FY 79 34 service jobs (guards and firefighters) are eliminated and their billets are distributed among Engineers/Scientists.

POSSIBLE MANPOWER PLANNING STRATEGIES TO BE
ANALYZED BY AGGREGATE PLANNING MODEL

Basic Problem: To determine the number of excesses and deficiencies in each occupational and grade grouping during the planning period FY 76 through FY 78 under a variety of manpower ceilings and goals with special emphasis on the effect of hires of junior professional engineers and scientists at the GS-5 through GS-7 level.

Problem A

a. Separation rate set equal to 5.5% for planning years.
b. Manpower ceilings remain unchanged for FY 76 to FY 78 (2902 FTP).
c. Lower bound of Engineer/Scientist GS-5 through GS-8 manpower goal set to 0.0 for each year.
d. Reductions taken proportionately across each occupational and grade grouping except GS-13 through GS-15.
e. Goals for GS-13 through GS-15 set at 554 for each planning year.
f. Promotion rate into GS-13 through GS-15 set equal to losses from the grade levels. All other grade groupings had normal promotion rate.

Problem B

Same as Problem A except manpower ceiling is as follows:

Date	FTP Ceiling
June 76	3075
June 77	2989
June 78	2902
June 79	2902

Problem C

Same as Problem A except 36 service jobs (guards and firefighters) are eliminated and their billets are distributed among Engineers/Scientists as follows:

33 to GS-9 through GS-12 Engineers/Scientists
3 to GS-5 through GS-8 Engineers/Scientists
36 TOTAL

FIGURE 2

Problem D

Same as Problem C except manpower ceiling is as follows:

Date	FTP Ceiling
June 76	3075
June 77	2989
June 78	2902
June 79	2902

Problem E

Same as Problem C except:

a. Separation rate is set equal to 5.0% for the planning years.
b. The manpower ceilings are as follows:

Date	FTP Ceiling
June 76	3015
Sept 76	3030
Sept 77	2882
Sept 78	2882

Problem F

Same as Problem A except that:

a. The separation rate is set equal to 5.0% for planning years.
b. The manpower ceilings are as follows:

Date	FTP Ceiling
Sept 76	3030
Sept 77	2926
Sept 78	2882
Sept 79	2882

Problem G

Same as Problem F except that in FY 77 and FY 78 thirty-four service jobs (guards and firefighters) are eliminated and their billets are distributed among Engineers/Scientists as follows:

3 to GS-5 through GS- 8
31 to GS-9 through GS-12
34 TOTAL

FIGURE 2 (Cont'd)

All problems had a GS-13 through GS-15 goals of 554 for FY 76 through FY 78. Our upper and lower manpower bounds are set at 10% of the goal, except for GS-13 through GS-15 and Engineer/Scientist GS-5 through GS-7 (referred to as "JPs" - Junior Professionals). The lower bound of the Engineer/Scientist GS-5 through GS-7 group is set to 0.0 with the upper bound set in normal fashion. This has the effect of letting the model freely select the best hiring policy for junior professionals which impacts our college recruiting program. In the case of the GS-13 through GS-15, the upper and lower bounds are set equal to the goal. This forces the model to have the exact number each time period. Since the promotions into the GS-13 through GS-15 group are also set to zero, then any "hires" for the GS-13 through GS-15 group are actually the number of allowable promotions from GS-12 to GS-13 for the time period. The penalties used in all the runs are 1 for hires, 5 fires, 3 positive descrepancy and 2 negative descrepancy.

At the present time, Problems F and G reflect our latest ceiling and are being used as a basis to establish both a plan for the allocation of billets and as a basis for the recruitment of junior professionals.

Figure 3 shows a list of suggested junior professional hiring under the different problem constraints. Problem A, B, C, and D were set up at the end of FY 75 in response to preliminary ceiling allocatiosn for FY 76 through FY 78. The solution suggested no hiring of junior professionals for FY 76. At that time our recruiting program was being prepared. It was decided to go ahead with the recruiting program pending final receipt of the FY ceilings. No formal commitments were made. As FY 76 progressed,

it was becoming more evident that ceilings woudl not be as tight as originally thought and that revised ceilings would be given the Center. In converting to the new fiscal year, calendar ceilings were revised so that Problem E was formulated. The solution to Problem E suggested the hiring of 22 junior professionals if the overall effect of RIFing 31 employees was achieved. The Center wanted to recruit the junior professionals but not at the expense of the other employees. In February 1975, the ceilings were revised upward again by about 30. At this point, we were already prepared to assess the impact on our recruiting problem because of the model and made the decision that our goal was between 20 and 25 junior professionals. Twenty-one junior professionals were hired during FY 76.

SUGGESTED JUNIOR PROFESSIONAL HIRES

PROBLEM	FY 76	FY 77	FY 78	FY 79
A	0	13	16	
B	0	0	0	
C	0	15	17	
D	0	0	21	
E	22	7	32	
F		25	25	26
G		26	27	27

Figure 3

Figure 4 is a summary of hiring including junior professionals that would be allowed under the constraints imposed by each of the seven problems. As can be seen, the critical period was during FY 76 in Problems A, C, and E. This occured when reduced ceiling cuts had to be taken within a short period of time (one fiscal year). Depending upon the problem the RIFs would have involved from 31 to 113 employees. This information was fed back to the Center of different manpower ceilings. Among the responsibilities of the Chief of Naval Material is the central management of nine Navy research and development laboratories. This information in part helped to stretch the drawdown requirements over a 3-year period. Problems F and G reflect the latest ceiling information to date on the planning period FY 77 through FY 79. These problems were set up when preliminary manpower ceilings were given to the Center. Again we were concerned about the impact of the ceilings upon recruiting. Problems F and G show that at least limited hiring would be permitted during all three planning years with FY 77 being the most restricted.

TOTAL HIRES (Including Junior Professionals)

PROBLEM	FY 76	FY 77	FY 78	FY 79
A	113 RIFs	116	169	
B	43	102	113	
C	113 RIFs	168	170	
D	44	103	103	
E	31 RIFs	38	32	
F		39	88	126
G		39	86	123

Figure 4

Problems F and G are now being used to reflect the current preliminary ceilings for FY 77 and through FY 79. Presently, we are planning to recruit about 25 junior professionals out of the approximately 39 total hires anticipated for FY 77. FY 78 and FY 79 will allow additional hires and the Center is planning to convert temporary employees to permanent as vacancies occur during FY 78 and FY 79.

The full summary report for Problem F is shown in Figure 5. In this report a multi-year summary is given including a line for each job category. The Aboard September 1976 data is the starting point for the forecast. For the years in the forecast data is shown on the projected on-board (Aboard) as well as indicated hiring and excesses (Reduction-in-Force).

With this interpretation in mind, the column entitled "RIFs" on the summary manpower report becomes the number by which the specified job category will increase under given management policies, and the column entitled "Hires" becomes the number of people that must be added to maintain the same proportions between the states. Under this interpretation, a RIF situation is indicated only when the TOTAL number of RIFs exceeds the TOTAL number of Hires, provided the TOTAL ceiling goal is met.

The Center has found the model useful in analyzing manpower policies on a strategic level. Changes in manpower goals can be easily reflected in the model. Other changes to the transition rates can also be made when we find that separation rates are trending either up or down. The model is also useful in indicating approximately how many of the high grade positions (GS-13 through GS-15) will be vacated during the planning periods which allows us to plan for promotions to these levels on a systematic basis.

DEPARTMENT OF THE NAVY

NAVAL UNDERWATER SYSTEMS CENTER

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PRODUCER CATEGORY	LEVEL	ABOARD SEP 76	SEP 77 ABOARD	SEP 77 HIRES	SEP 77 RIFS	SEP 78 ABOARD	SEP 78 HIRES	SEP 78 RIFS	SEP 79 ABOARD	SEP 79 HIRES	SEP 79 RIFS
SCI & ENGRS	GS 1-4										
SCI & ENGRS	GS 5-8	58	54	25		53	25		53	26	
SCI & ENGRS	GS 9-12	847	812		42	798		20	798		6
SCI & ENGRS	GS 13-15	532	532	22		532	22		532	22	
SCI & ENGRS	GS 16-18	9	9	1		9	1		9	1	
OTHER PROFS	GS 1-4										
OTHER PROFS	GS 5-8	18	17		5	16		4	16		3
OTHER PROFS	GS 9-12	102	98		6	97		3	97		1
OTHER PROFS	GS 13-15	12	12	2		12	2		12	2	
OTHER PROFS	GS 16-18										
SUB PROF & T	GS 1-4	7	7		2	6		3	6		2
SUB PROF & T	GS 5-8	193	185	30		182	33		182	36	
SUB PROF & T	GS 9-12	557	534		23	524		10	524		
SUB PROF & T	GS 13-15	6	6			6			6		
SUB PROF & T	GS 16-18										
MGRS & ADMIN	GS 1-4										
MGRS & ADMIN	GS 5-8	11	10		1	10			10		
MGRS & ADMIN	GS 9-12	28	27		4	26		4	26		3
MGRS & ADMIN	GS 13-15	6	6	2		6	2		6	2	
MGRS & ADMIN	GS 16-18										
CLERICAL	GS 1-4	186	178	41		175	44		175	46	
CLERICAL	GS 5-8	148	143		2	139			139	3	
CLERICAL	GS 9-12										
CLERICAL	GS 13-15										
CLERICAL	GS 16-18										
SERVICE	GS 1-4	23	22	2		22	3		22	3	
SERVICE	GS 5-8	12	11		1	11			11		
SERVICE	GS 9-12										
SERVICE	GS 13-15										
SERVICE	GS 16-18										
PRODUCER TOTALS		2755	2663	125	86	2624	132	44	2624	141	15
GRAND TOTALS		2755	2663	125	86	2624	132	44	2624	141	15

THIS IS THE ORIGINAL VERSION OF PROBLEM F.

Figure 5

Example of CURRM Full Summary Report

This is especially true in light of current ceilings for high grade positions.

The Center has been under both average grade and high-grade constraints from our higher headquarters (Chief of Naval Material) at various times over the last three years. Since these two problems are somewhat related, the model has been useful in allowing management to anticipate the consequences of any actions before they take place. Since the Center is required to stay within the constraints of high-grade positions, promotions at these particular grade levels are important. The Center has set up a promotion review board which receives promotions and sets up the priority of the promotions. The model has been useful in estimating the number of vacancies expected over various time periods so that management knows well in advance the number of promotions that can be effected. This has helped the Center to take a more organized approach to solving the problem of allocation of these resources and has allowed the positions to be filled on a more timely basis thus helping in a small way to maintain morale.

PROGRAM PLANNING AND PROMOTION MODELING CONSIDERATIONS

The examples in the previous section clearly show that the conversational model has become an integral part of the Center's management support capabilities. Now that the technical and implementation problems of this version of the model have resolved, attention is turning on ways to improve the modeling capabilities themselves. In particular, the management studies using the current models indicate the desirability of better program planning and promotion policy models.

The critical manpower management problems at the Center remain in accomodating average grade and ceiling controls imposed from above and realistic promotion policies acceptable to the Center management and personnel. This also would provide a mechanism for building equal employment opportunity considerations directly into the workforce analysis and planning system. Such a system would be directly tied to the Center's program planning objectives as well as to the impacts of changes in the structure of the employee population. The system must also take into account the recent change of the NSUC organization from a functional to a product line structure.

It appears that what is required is a system with a strategic planning model coherently linked to sub-organizational models for each of the major product lines. This requires a new model technology bringing the multi-period planning model together with organization design models more closely related to individual man-job assignment possibilities. A number of new mathematical possibilities along these lines are being investigated by joint research of the Office of Civilian Personnel, the Navy Personnel Research and Development Center, the University of Texas, and Harvard

University.[1/] The studies at NUSC will represent some of the first operational tests of this new technology.

An important feature of these new models would be to explicitly consider the possible changes to the projected personnel movement rates necessary to effect promotion strategies. This differs from the current model which uses projected movement rates which are not changed during the model linear programming solution process. The only way changes to the current promotion rates can be entered into the model is to interactively change them to the approximate values desired. An output of the new models would include the values required to effect a given promotion strategy. This, of course, would be within some realistic boundary conditions on the rates themselves.

Once this integrated strategic planning-product line workforce planning structure is known better, further organization design modeling may be possible. Testing of a man-job assignment system has been underway at the Center for the past year using task analysis questionnaries as the input document.[2/] Preliminary results indicate that the data questionnaires are of value for supervisory appraisal. However, the data collection in this application appears to require more resources than currently available. Modifications to a much abbreviated data questionnaire may be possible to feed another organization design model. The details of this research will be provided in forthcoming reports.

[1/] See Charnes, Cooper, Lewis and Niehaus [1] for one of the new possibilities initially oriented towards equal employment opportunity planning.

[2/] See [5] and [6] for a description of this technology.

The eventual intent is to make the new workforce analysis and planning system conversational as much as possible in terms of computer support. The initial versions, however, will be developed in the interactive batch computer environment until the computer support arrangements become clear. As has been demonstrated with the current NUSC model capabilities, the conversational versions lend themselves to easier acceptance on the part of the management and staff users. This development will follow the same type of testing with operational problems which has led to the successful implementation of current NUSC manpower policy testing model.

BIBLIOGRAPHY

[1.] Charnes, A., W. W. Cooper, K. A. Lewis and R. J. Niehaus "Multi-Level Coherence Models for Equal Employment Opportunity Planning", Management Science (forthcoming)

[2.] Charnes, A., W. W. Cooper, and R. J. Niehaus Studies in Manpower Planning (Washington, D. C.: U. S. Navy Office of Civilian Manpower Management, 1972)

[3.] Charnes, A., W. W. Cooper, and R. J. Niehaus, and K. Padalino "Integrated Manpower and Program Planning Models for Laboratory Management" OCMM Research Report No. 17 (Washington, D. C.: U. S. Navy Office of Civilian Manpower Management, 1973)

[4.] Mannis, L. S. "Application of the Navy Average Grade Model to the Naval Underwater Systems Center" NUSC TM No. MA 11-4138-72 (Newport, R. I.: Naval Underwater Systems Center, 1973)

[5.] Moore, B. E. "Occupational Analysis for Human Resource Development" OCCM Research Report No. 25 (Washington, D. C.: U. S. Navy Office of Civilian Manpower Management, 1976)

[6.] Moore, B. E. and D. Sholtz "Organizational Tests of a Static Multi-Attribute Assignment Model" OCMM Research Report No. 20 (Washington, D. C.: U. S. Navy Office of Civilian Manpower Management, 1974)

[7.] Niehaus, R. J. and D. Sholtz "A Navy Shore Activity Manpower Planning System for Civilians", OCMM Research Report No. 24 (Washington, D. C.: U. S. Navy Office of Civilian Manpower Management, 1976)

[8.] Niehaus, R. J., D. Sholtz, and G. L. Thompson "Managerial Tests of Conversational Manpower Planning Models", OCMM Research Report No. 22 Management Science (forthcoming)

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This report describes the operational use of a conversational manpower model at the Naval Underwater Systems Center (NUSC). In this application the intent is to provide the technology to permit two-way dialogues between the manpower analyst/manager and the supporting computer-based models. This includes a description of the operational use of this system as part of a major relignment of NUSC's workforce.